Observations on the Nesting Behavior of *Ammophila nasalis*

(Hymenoptera: Sphecidae)

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During June 8–9, 1975 I made some observations on the nesting behavior of *Ammophila nasalis* Provancher near San Carlos, Baja California Sur, Mexico. These will add to the information on the nests and prey of *A. nasalis* given by Hicks (1935) (under the name *Sphex craspedotus*; see Menke 1965).

The wasps were nesting in the open spaces between low halophytic shrubs in a large flat area of firm sand. A single nest of *A. nasalis* was excavated by Dr. A. S. Menke at a similar nesting site on the University of California at Santa Barbara campus at Goleta (June 1959) (personal communication). Hicks' observations were made along a sandy riverbank of the Los Angeles river near Burbank, California.

During mid afternoon on June 8 female A was observed digging a nest. She made several successive flights backwards from the nest entrance dropping a spray of sand 20–30 cm from the nest entrance and 10–20 cm above the ground. Most *Ammophila* species deposit soil from burrow excavation while in flight (Evans 1959).

At 1345 on June 9 female B was observed leaving her nest, which had a small white shell as a temporary closure. She flew about 30 meters and started to investigate some of the nearby shrubs. During the afternoon she was observed to return to the nest five times, carrying prey in her mandibles. Upon landing at the nest she first dropped the prey then removed the shell from the burrow entrance (fig. 1). She then grasped the prey and backed into the burrow, then replaced the shell when she left. This sequence was observed during the first four times she returned to the nest. Similar observations were reported by Hicks (1935). The hunting times ranged from 7 to 12 min. ($\bar{X} = 11$, $N = 4$). When she left on the fifth hunting flight the nest was carefully excavated so that one side was open (fig. 2); all of the caterpillar prey were removed except the one bearing the egg. A plastic stake was used to cover the exposed side of the burrow and both the sand and the temporary shell closure were replaced. The female returned in 75 min. and entered the

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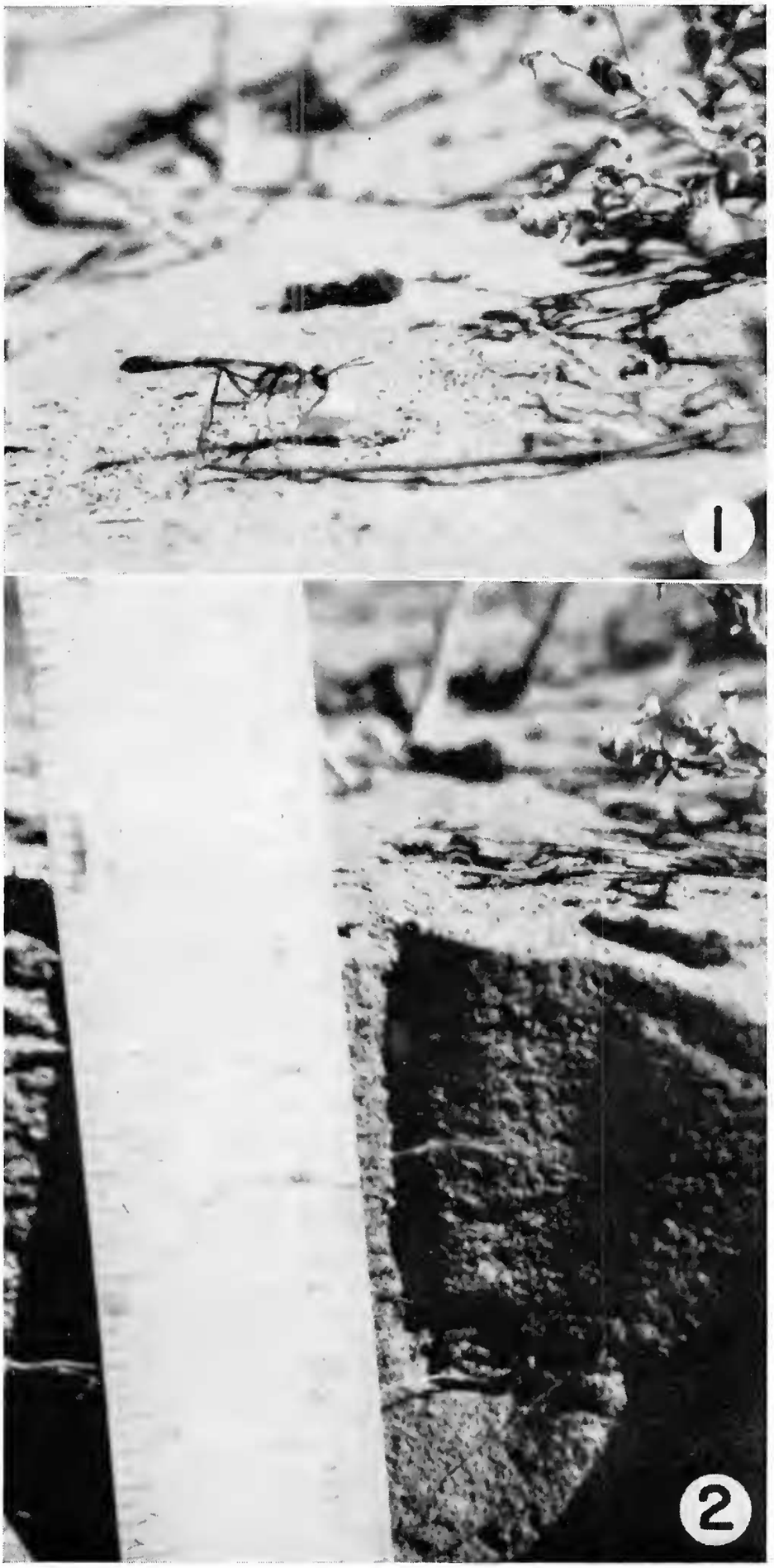
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nest with prey. She then made a final closure by pushing the shell down into the burrow, depositing pieces of debris into the burrow with her mandibles and using alternate movements of her front legs to push sand into the burrow. The total time for the final closure was three minutes.

In his study of *A. campestris* Jur. (= *pubescens* Curtis) Baerends (1941) found that each female takes care of more than one nest at a time. He showed that the wasp visited each hole in the morning before hunting. If prey were removed from a nest by an experimenter, before the morning inspection, the female would bring in more prey than usual to replace the missing ones. If cell contents were decreased after the morning inspection the female did not bring in more prey. Apparently *A. nasalis* mass provisions one burrow at a time but like *A. pubescens* does not respond to the number of prey in the cell during the day. This is evidenced by the above manipulation of cell contents; only two small caterpillars, not enough to sustain a larva, remained with the egg when the wasp made the final closure.

The shape of the burrow was typical of other *Ammophila* species as given by Evans (1959) (fig. 2). The depth of the vertical burrows was 5.5 cm (female A) and 4.0 cm (female B). The single nest which was excavated by Dr. Menke was 5.0 cm in depth but the three examined by Hicks were deeper (8.2–8.6 cm).

Each burrow at the Baja California site ended in a horizontal cell approximately 2.5 by 1 cm. The nest of female A, which was not completed when excavated, had a lump of sand as a temporary closure and contained 10 geometrid caterpillars (identified by D. M. Weisman). The egg was positioned transversely on the dorsal side of abdominal segments 3 and 4 of the caterpillars. The nest of female B had a total of 12 geometrid prey. Hicks (1935) also observed *A. nasalis* to use geometrid prey but the single uncompleted nest at Goleta, California contained a lycaenid caterpillar.

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FIGS. 1–2. Nesting of *Ammophila nasalis*. Fig. 1. Female B removing temporary closure (shell) from burrow entrance. Fig. 2. Nest of female B showing the temporary closure in the upper part of the burrow and geometrid caterpillars in the cell.

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SCIENTIFIC NOTE

Larvae of *Coelus ciliatus* parasitized by *Reinhardiana petiolata* (Coleoptera: Tenebrionidae; Diptera: Tachinidae). In May and June 1975 two adults of *Reinhardiana petiolata* (Townsend) emerged from larvae of *Coelus ciliatus* Eschscholtz collected from coastal sand dunes in California. Adults of this fly are common over much of western North America (Stone, *et al.*, 1965, Catalog of the Diptera of America North of Mexico, U.S. Government Printing Office), but hosts of the immature stages were previously unknown for the tribe Melisoneurini, in which *Reinhardiana* is classified (P. H. Arnaud, personal communication).

Flies were reared from two collections of *Coleus* larvae. One adult female emerged on V-22-1975 from a dead parasitized larva collected at Dune Lakes, 3 mi. S Oceano, San Luis Obispo County, California, IV-29-1975. One adult male emerged about VI-18-1975 from a larva collected at Point Reyes National Seashore (South Beach), Marin County, California, IV-19-1975. This larva appeared healthy when collected, showing no evident distress until the fly maggot pupated between May 21–28, after killing the host. These dates indicate a pupal period of 23–30 days.

The *Reinhardiana* larvae inhabit the haemocoele of the long, slender host without causing a noticeable bulge until pupation. The fly puparia are about twice the diameter of the beetle larva, whose body wall becomes stretched around the parasite, giving the appearance of a snake containing a recent large meal. Both puparia were lodged in abdominal segments 4–8, at about the midregion of the host's body. One puparium had the anterior end directed posteriorly in the host, the other anteriorly. Emergence was through the dried body wall near the apex of the puparium.

The broad ecological and geographic occurrence of *Reinhardiana* and the limited Pacific coastal sand dune distribution of *Coelus ciliatus* suggest a broad host range for this fly, possibly including other families of ground dwelling beetles.

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